We Claim:

1. A system for removing waste from the blood of an individual comprising

a blood processing device comprising a gap defined between an inner surface that is located about an axis and an outer surface that is concentric with the inner surface, at least one of the inner and outer surfaces carrying a membrane that consists essentially of at least one of a hemofiltration membrane and a hemodialysis membrane, and

a drive mechanism causing relative movement between the inner and outer surfaces about the axis at a selected surface velocity, taking into account the size of the gap, to create movement of the blood within the gap that induces transport of cellular blood components from the membrane while plasma water and waste material are transported to the membrane for transport across the membrane.

2. A system according to claim 1

wherein the membrane comprises a hemofiltration membrane.

3. A system according to claim 2

wherein the hemofiltration membrane includes a first surface facing toward the gap and a second surface facing away from the gap, and

wherein the blood processing device includes a channel along the second surface of the hemodialysis membrane to convey waste material transported across the hemofiltration membrane.

4. A system according to claim 1

wherein the membrane comprises a hemodialysis membrane.

5. A system according to claim 4

wherein the hemodialysis membrane includes a first surface facing toward the gap and a second surface

facing away from the gap, and

wherein the blood processing device includes a channel to convey a dialysate along the second surface of the hemodialysis membrane to create a concentration gradient across the hemodialysis membrane to transport waste material from the blood, and

further including a source of dialysate communicating with the channel.

6. A system according to claim 1

wherein the drive mechanism rotates the inner surface while holding the outer surface stationary.

7. A system according to claim 1

wherein the drive mechanism rotates the inner surface at a higher rate of rotation than the outer surface.

8. A system according to claim 1

wherein both surfaces carry a membrane that consists essentially of at least one of a hemofiltration membrane and a hemodialysis membrane.

9. A system according to claim 8

wherein both surfaces carry a hemodialysis membrane.

10. A system according to claim 8

wherein both surfaces carry a hemofiltration membrane.

11. A system according to claim 8

wherein one of the surfaces carries a hemofiltration membrane and the other surface carries a hemodialysis membrane.

12. A method for removing waste from the blood of an individual comprising the steps of

conveying the blood through a gap defined between an inner surface that is located about an axis and an outer surface that is concentric with the inner surface, at least one of the inner and outer surfaces

carrying a membrane that consists essentially of at least one of a hemofiltration membrane and a hemodialysis membrane, and

causing relative movement between the inner and outer surfaces about the axis at a selected surface velocity, taking into account the size of the gap, to create movement of the blood within the gap that induces transport of cellular blood components from the membrane while plasma water and waste material are transported to the membrane for transport across the membrane.

13. A method according to claim 12

wherein the membrane comprises a hemofiltration membrane.

14. A method according to claim 13

further including the step of conveying away waste material that is transported across the hemofiltration membrane.

15. A method according to claim 12

wherein the membrane comprises a hemodialysis membrane.

16. A method according to claim 15

further including the step of conveying a dialysate along an opposite side of the hemodialysis membrane to create a concentration gradient across the hemodialysis membrane to transport waste material from the blood.

17. A method according to claim 12

wherein the inner surface is rotated while holding the outer surface stationary.

18. A method according to claim 12

wherein the inner surface is rotated at a higher rate of rotation than the outer surface.

19. A method according to claim 12

wherein both surfaces carry a membrane that consists essentially of at least one of a hemofiltration

membrane or a hemodialysis membrane.

20. A method according to claim 19 wherein both surfaces carry a hemodialysis membrane.

21. A method according to claim 19 wherein both surfaces carry a hemofiltration membrane.

22. A method according to claim 19 wherein one of the surfaces carries a hemofiltration membrane and the other surface carries a hemodialysis membrane.